UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
BIN C15700
Seattle, WA 98115-0070

NMFS Tracking
No. 2003/01272

March 31, 2004

Daniel M. Mathis
Division Administrator
Federal Highway Administration
711 S. Capitol Way, Suite 501
Olympia, Washington 98501

Re: Endangered Species Act section 7 Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Snohomish River Bridge 522/138 Scour Repair Milepost 20.50 to 20.82, Snohomish County (HUC 171100100404, Cherry Creek and 171100090599, Skykomish River/Woods Creek)

Dear Mr. Mathis:

In accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1536), and the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (16 U.S.C. 1855), the attached document transmits NOAA's National Marine Fisheries Service (NOAA Fisheries) Biological Opinion (Opinion) and Essential Fish Habitat (EFH) consultation on the proposed Snohomish River Bridge 522/138 Scour Repair Milepost 20.50 to 20.82, Snohomish County, Washington.

The Federal Highway Administration (FHWA) has determined that the proposed action was likely to adversely affect Puget Sound (PS) chinook salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU). Formal consultation was initiated on October 3, 2003.

This Opinion reflects formal consultation and an analysis of effects covering listed PS chinook salmon in the Snohomish River near the confluence of the Snoqualmie and Skykomish Rivers, Washington. The Opinion is based on information provided in the Biological Assessment received by NOAA Fisheries on October 3, 2003, subsequent information transmitted by telephone conversations, and e-mail. A complete administrative record of this consultation is on file at the Washington State Habitat Office.

NOAA Fisheries concludes that the implementation of the proposed project is not likely to jeopardize the continued existence of PS chinook salmon. Please note the incidental take statement, which includes Reasonable and Prudent Measures and Terms and Conditions, was designed to minimize take.

The MSA consultation concluded that the proposed project may adversely impact designated EFH for chinook, coho (*O. kisutch*), and PS pink (*O. gorbuscha*) salmon. NOAA Fisheries included conservation recommendations that if implemented, will sufficiently address adverse effects to EFH.

If you have any questions, please contact Neil Rickard of my staff at the Washington State Habitat Office at (360) 753-9090, by e-mail at neil.rickard@noaa.gov, or by mail at the letterhead address.

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

Enclosure

Endangered Species Act - Section 7 Consultation
Biological Opinion
and
Magnuson-Stevens Fisheries Conservation and Management Act
Essential Fish Habitat Consultation

Snohomish River Bridge 522/138 Scour Repair Milepost 20.50 to 20.82
Snohomish County, Washington

Agency: Federal Highway Administration

Consultation Conducted By: National Marine Fisheries Service

Date: March 31, 2004

Issued by: For Michael R Crouse

D. Robert Lohn
Regional Administrator

NMFS Tracking Number: 2003/01272

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1.0 INTRODUCTION

This document transmits NOAA's National Marine Fisheries' (NOAA Fisheries) Endangered Species Act Biological Opinion (Opinion) and Magnuson-Stevens Fisheries Management Act (MSA) consultation based on our review of the proposed Snohomish River Bridge (No. 522/138) Scour Repair, Milepost 20.50-20.82 project, located in Snohomish County, Washington. The proposed project consists of installing four rock barbs below the ordinary high water mark (OHWM) as a temporary solution to address the scour problem. Currently, bridge piers, footings, and abutments are subject to severe erosion and require maintenance in accordance with Federal Highway Administration (FHWA) guidelines. The proposed design includes one rock barb on the left bank of the mainstem Snohomish River, and three rock barbs on the right bank of the Skykomish River overflow channel. The barbs will function to direct flows away from the streambanks protecting the structure up to a 100-year flood event. The design life of the project is ten years.

The proposed project is considered a temporary fix. The FHWA has funded a new bridge at this location, currently expected to be contracted for construction in March 2009. A new bridge, if designed properly, could permanently resolve the scour threats, and thus the need for further bank stabilization and scour repairs that are currently encountered at the existing bridge. The FHWA will readdress the barbs' function and purpose as the new bridge is designed.

The proposed project is located at the confluence of the Skykomish, Snoqualmie, and Snohomish Rivers in the Skykomish River/Woods Creek and Cherry Creek 6th field hydrologic unit code (HUC) numbers 171100090599 and 171100100404, respectively. These rivers drain into Possession Sound and are within the geographic range of the Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU). The rivers are also Essential Fish Habitat (EFH) for PS chinook, coho (*O. kisutch*), and PS pink (*O. gorbushca*) salmon.

1.1 Background and Consultation History

The SR 522 bridge (No. 522/138) is approximately 40 years old, and crosses the Snohomish River about 2.5 miles west of Monroe, Washington. The bridge is located just downstream of the Snohomish's confluence with the Skykomish and Snoqualmie Rivers. The bridge spans approximately 500 feet of river channel and 800 feet of floodplain on the right bank. Presently, the old channel of the Skykomish River functions as an overflow channel during higher (approaching one year recurrence interval) flows. This overflow channel currently flows adjacent to the bridge piers on the right bank. This channel was once the primary channel for the Skykomish River. The bridge is supported by two end abutments and eight intermediate piers. Pier 2 is adjacent to the left bank and Pier 4 is on the right bank, while piers 5 through 8 are in the right bank floodplain and pier 9 is partially buried in the end slope of the east approach fill. Pier 3 is the only pier in the river channel. The average riverbed elevation near the bridge is approximately plus 5 feet national geodetic vertical datum (NGVD) of 1929, with localized pockets of scour down to about minus 1.9 feet NGVD.

On October 3, 2003, NOAA Fisheries received a Biological Assessment (BA) and EFH assessment for the above referenced project and a request for an Endangered Species Act (ESA) section 7 and MSA consultation from the FHWA. The FHWA concluded that the proposed action is Likely to Adversely Affect (LAA) PS chinook salmon and will likely result in adverse effect to EFH for PS chinook, coho, and PS pink salmon. Below is a detailed list of meetings, correspondence, and site visits that took place prior to and during consultation.

On June 28, 2001, representatives from NOAA Fisheries, the United States Fish and Wildlife Service (FWS), the FHWA and the Washington State Department of Transportation (WSDOT) met to discuss information, analysis, and minimization needs identified in a March 2, 2001 letter from the FWS.

On June 9, 2003, representatives from NOAA Fisheries, the FWS, the FHWA, the Tulalip Tribe, Snohomish County, and the Washington State Department of Fish and Wildlife (WDFW) met so that WSDOT could present a new design. The new design employed a reach analysis (WSDOT 2003a) and the Integrated Streambank Protection Guidelines (DOE *et al.* 2003). Specifically, the new design included four riprap bank barbs, incorporation of Large Woody Debris (LWD) and vegetation, as well as a plan to reconnect adjacent floodplain habitat.

A site visit was conducted by participants from NOAA Fisheries, the FWS, and WSDOT on July 14, 2003 to familiarize agency representatives with the project area prior to the forthcoming final BA submittal. NOAA Fisheries and the FWS (Services) raised questions and concerns about particular aspects of the proposed project. Specifically, how the proposed barb designs would incorporate wood into them and what sort of re-vegetation plan would be proposed in the final BA. Most questions were answered by referencing the draft plan sheets and/or the information found in the Site/Reach Assessment report provided by WSDOT. The meeting notes were distributed on July 17, 2003 and focused on the remaining issues that were not addressed as a result of the July 14, 2003 site visit. It was determined by the Services that all concerns had been addressed.

A follow-up site visit was conducted on December 22, 2003 for participants that were not able to attend the July 14, 2003 visit and to revisit the site after recent flooding. All remaining questions and issues were addressed on-site that day.

This document is based on information provided in the BA and subsequent addenda, all supporting documents, EFH assessment, and correspondence received from the applicant via site visits, phone calls, post and electronic mail (e-mail). All correspondence is documented in the administrative record, located in the Washington State Habitat Office, Lacey, Washington.

1.2 Description of the Proposed Action

The project will be funded in whole or part by the FHWA, to be constructed by the funding recipient, WSDOT. The WSDOT has been designated as the non-Federal representative on state highway projects requiring section 7 consultation under the ESA (50 CFR 402.13). The FHWA, through its designated non-Federal representative WSDOT, proposes to repair existing erosion damage and prevent future scour to the Snohomish River Bridge No. 522/138 in Snohomish County, Washington. This bridge spans the Snohomish River between Milepost (MP) 20.50 and MP 20.82 of State Route (SR) 522 about 2.5 miles southwest of Monroe, Washington. The bridge is located in Township 27 North, Range 6 East, in the northwest quarter of Section 16. Currently, the bridge piers, footings, and abutments are subject to severe erosion and require maintenance in accordance with the FHWA guidelines. The WSDOT therefore proposes to install four rock barbs above and below the OHWM as a temporary solution to address the scour problem. The proposed design includes one rock barb on the left bank of the mainstem Snohomish River, and three rock barbs on the right bank in the overflow channel of the Skykomish River. The barbs will function to direct flows away from the streambanks, thereby protecting the existing structure up to a 100-year flood event. It will be necessary to acquire materials such as rock, LWD, and wood chips prior to construction. The WSDOT will acquire and store any necessary off site-materials at least 150 feet from any wetland or stream, and outside the confines of habitat for ESA listed species. Disposal of left-over material will take place only at a WSDOT-approved location. The elements of the proposed action relevant to the effects analysis for PS chinook salmon are summarized below:

1.2.1 Vegetation Clearing

The proposed project will require the clearing of 0.19 acre of riparian vegetation, 0.02 acre of vegetation within a wetland on the left bank, and 0.30 acre of riparian vegetation on the right bank to install the temporary access roads. Approximately 0.17 acre of vegetation will also be cleared on the right bank to remove an existing rock wall. On the right bank, 0.15 acre of an agricultural field, plus riparian-forested areas, and 0.02 acre of streambank vegetation will be cleared. Clearing includes the removal of 22 trees measuring between 8 and 17 inches diameter at breast height (dbh).

1.2.2 Construction of Temporary Access Roads

The proposed project will require the construction and removal of temporary access roads on the left and right banks to provide a pathway for excavation equipment. The following Best Management Practices (BMPs) will be implemented for the construction of all access roads:

- Clearing limits and wetlands will be marked prior to vegetation removal.
- A stabilized construction entrance will be used.
- A silt fence will be installed and maintained around all access road footprints.
- Wood chips, derived from cleared local vegetation, geo-textile fabric, or geo-grid mats will be used to separate the native soils from the access road materials. If additional support is necessary, the access road will most likely consist of an even layer of wood chips mixed with crushed rock on top of the geo-textile. The use of wood chips will allow oxygen to

flow to the existing vegetation and roots below the geo-textile reducing impacts to native vegetation.

- A steel plate will be placed over an existing culvert on a Snohomish County type 5 stream (Snohomish County 2003) running beneath the proposed left bank access road, to withstand the loads of construction equipment.

1.2.3 Breach and Removal of a Rock Wall

An approximately 0.05 acre rock wall will be removed to alleviate hydraulic pressure during periods of over bank flow. The wall is located on the right bank of the Skykomish River flood plain terrace just downstream of the bridge. Up to 75% of the wall is located within the 150-foot stream buffer of the OHWM. The rock from the wall will be used to construct two of the barbs and 14 tetrapods (tetrapods are four-sided triangular shaped rock pyramids). Construction equipment will enter the right bank via the grass field and the newly cleared access roads.

1.2.4 Installation of Rock Barbs

The proposed project will install four barbs, one into the left bank of the Snohomish River extending a maximum of 60 feet waterward of the OHWM, and three into the right bank overflow channel of the Skykomish River extending approximately 30 to 40 feet waterward of the OHWM. The barbs will require 1,250 cubic yards (CY) of fill below the OHWM, a surface area equivalent to 0.24 acre, and 54 CY of excavation and 153 CY of fill above the OHWM in the streambank, a surface area equivalent to 0.033 acre. Construction equipment will access the streambank to excavate and install riprap and LWD. An excavator with a clamshell or an articulated thumb attachment will most likely be used for rock placement. The streambank or the barb itself will serve as the staging platform, making in-water work platforms unnecessary. Inwater work will be limited to the work window of 1 July to 1 September and should take no more than 12 to 15 days. The work will include placing rock and wood with an excavator and securing the structures together for stability. Riprap from off-site will be free of fines, soil, or other extraneous materials. The majority of inwater work will be associated with the construction of the two barbs within the flowing channel. The right bank overflow channel will be partially dry during the work window, reducing the amount of inwater work for the remaining two barbs. Prior to construction, WSDOT will perform a buoyancy analysis on the proposed design to ensure the stability and function of the LWD. The results of the analysis may change the amount of required fill, plus or minus ten percent from the current proposal.

1.2.5 Installation of Tetrapods

An excavator will be used to place 14 tetrapod structures in areas adjacent to the footprint of the removed temporary access roads along the right bank of the Skykomish River overflow channel. The tetrapods will each be 9 feet long and 7 feet high, will be partially buried in the floodplain above the OHWM, and will occupy 0.016 acre of floodplain. The tetrapod structures will provide roughness features in the floodplain and discourage the formation of preferential flow pathways beneath the bridge.

1.2.6 Construction Sequencing Timetable

Month/Season	Activity
June 21, 2004/ Spring	-Install Temporary Erosion and Sediment Control Measures -Demarcate the clearing limits -Clear vegetation -Construct access roads -Haul materials to the project site -Breach rock wall -Start work above the OHWM
July 1-September 1, 2004/ Summer	-Install barbs below OHWM (two weeks total for in-water work) -Place live fascines and tetrapod rock piles -Remove access road fill
August 31, 2004/ Fall	-Plant cottonwood trees and native vegetation -Dispose of any left-over materials

1.2.7 Conservation Measures

The proposed project design incorporates the following conservation measures to minimize or offset the impacts to PS chinook salmon:

- Inwater work will take place between July 1 and September 1, 2004 to minimize impacts to PS chinook. This is a period when juvenile and adult abundance can be expected to be low, when river discharge is low, and when weather is generally favorable for construction.

- Minimization measures will be employed to control erosion, sedimentation, and chemical spills in accordance with WSDOT standards and specifications (WSDOT 2002). WSDOT will develop and implement a Temporary Erosion and Sediment Control (TESC) plan and Spill Prevention Control and Countermeasures (SPCC) plan.

- Large woody debris (LWD), a minimum of 12 inches dbh and a minimum 30 feet in length, including root balls a minimum of 5 to 6 feet in diameter, will be incorporated into the barbs along the right bank of the Skykomish River overflow channel. The LWD will be impaled into the bed of the channel and will be located below the OHWM, thereby providing the greatest habitat value and longevity. The proposed submerged depth will assure that there is adequate rock to provide structural stability, while providing sufficient woody debris for habitat enhancement.

- Approximately 130 live stake fascines, comprised of bundles of live cottonwood, alder, and willow cuttings will be placed at the top of the right bank around the key portion of the barbs and in the footprint of the temporary access roads. The fascines will cover an area of about 0.06 acre (2,600 square feet) and will provide roughness features near the streambank to reduce flow velocities and rehabilitate riparian conditions along the streambank adjacent to the barb keys.

- Approximately 500 live cottonwood trees, 4 to 6 inches dbh, on 8- to 10-foot centers will be planted to help restore riparian functions in the floodplain. The trees will be planted landward of the rock wall in an area of approximately 0.95 acres, and are expected to take root rapidly and provide floodplain roughness features and bank stability.

1.2.8 Monitoring Plan and Contingencies

The WSDOT will implement a qualitative and quantitative monitoring plan, with contingencies, to analyze the effectiveness of the project for a minimum of three years. The monitoring plan will include performance measures to ensure that the barb structures and LWD provide the habitat features they are designed to. If the barb structures are not properly functioning, remediation will take place to restore the structures to functioning condition. If the LWD habitat features in the barbs fail, alternative locations within the river reach will be considered for LWD placement to provide for the formation of pool habitat complexity. If these contingency measures are not successful, WSDOT will coordinate with NOAA Fisheries and other permitting agencies to achieve the stated performance standards. The monitoring plan will assess baseline conditions, as-built conditions, and habitat conditions each year for 3 years. The monitoring plan methodology will include protocols used in the Timber Fish and Wildlife process, Stream Habitat Inventory and Mapping, and the Photo Point Monitoring Method.

1.3 Description of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02 and 402.14(h)(2)). NOAA Fisheries interprets this to mean effects of the action on the physical, biotic and chemical environment and not just on the listed species. For purposes of this consultation, the action area included the greatest potential extent of upstream and downstream effects of the project on water bodies, associated wetlands, and floodplains because of the placement of temporary roads, floodplain roughness features, and re-vegetation.

The action area includes the Skykomish River overflow channel, extending 200 feet above the upstream barb, downstream to a point in the Snohomish River a distance of 0.25 mile below the bridge. The upstream limit is defined by the extent of construction related turbidity in the backwaters of the Skykomish River overflow channel. The downstream limit is defined by the extent of the anticipated thalweg adjustment in the Snohomish River resulting from placement of the barbs. The action area includes the access road and Wetland E on the left bank and the floodplain terrace including the access roads, rock wall, and Wetland A on the right bank.

2.0 ENDANGERED SPECIES ACT

The purpose of consultation under the ESA is to ensure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of threatened or endangered species. The effects of the project to the PS chinook ESU are analyzed below because an ESU is a distinct population segment that is available for ESA protection, consistent with section 3(16) of the ESA. Formal consultation concludes with the issuance of an Opinion under section 7(b)(3) of the ESA.

2.1 Evaluating the Proposed Action

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize listed species, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

For the proposed action, NOAA Fisheries' jeopardy analysis considers direct and indirect mortality of fish attributable to the action. NOAA Fisheries' jeopardy analysis also considers the extent to which the proposed action affects the quantity and quality of salmonid habitat by assessing the functions of habitat elements necessary for migration, spawning, and rearing of the listed salmon under the existing environmental baseline.

2.1.1 Biological Requirements

The relevant biological requirements are those necessary for PS chinook to survive and recover to naturally reproducing population levels, at which time protection under the ESA will become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

Biological requirements are considered habitat conditions that are relevant to any chinook life stage. Information related to biological requirements for PS chinook can be found in Spence *et* *al.* 1996. Long-term and recent declines in distribution and abundance of PS chinook may be attributed, in part, to substantial fragmentation and simplification of habitat structure and distribution; and altered natural processes that route sediment and organic materials in the action area and throughout the watershed. One of the factors believed essential to improve the status of chinook salmon is an improvement to habitat conditions.

For the proposed action, the relevant biological requirements for PS chinook are water quality, habitat elements such as riparian structure, LWD, and pool frequency and quality, and channel conditions and dynamics such as streambank condition and floodplain connectivity. NOAA Fisheries' analysis focuses on how the proposed action affects these biological and habitat requirements in the mainstem Snohomish River and off-channel areas near the mouth of Skykomish River.

2.1.2 Environmental Baseline

The environmental baseline represents the current set of basal conditions to which the effects of the proposed action are then added. Environmental baseline is defined as "the past and present impacts of all Federal, state, and private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or informal ESA section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation process" (50 CFR 402.02).

The environmental baseline reflects a history of past anthropogenic activities and existing conditions that include impaired habitat conditions. The effects of various land uses influence present habitat conditions. The results of past activities block or hinder access to historical spawning habitat. Past forestry and agriculture activities affect the upper and lower watershed, respectively. Diking for flood control, as well as draining and filling of freshwater and estuarine wetlands for urban development are cited as problems throughout the action area (WDF *et al.* 1993). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in the action area.

The PS Salmon Stock Review Group (PFMC 1997) concluded that reductions in habitat capacity and quality have contributed to escapement problems for PS chinook salmon. The PFMC 1997 cited evidence of direct losses of tributary and mainstem habitat due to: (1) dams, (2) loss of slough and side-channel habitat caused by diking, dredging, and hydromodification and (3) reductions in habitat quality due to land management activities.

Finally, the nearshore habitats in the action area have also been degraded from development activities. Estuaries and marine shorelines suitable for rearing and outmigrating salmonids is decreasing. Approximately 30% of the shoreline in the state has been armored, with approximately 1.7 miles of Puget Sound shoreline being armored each year (WDNR 2001; Canning and Shipman 1995).

Snohomish, Skykomish, and Snoqualmie Rivers

The Snohomish River basin is the second largest drainage system in Puget Sound, draining 1,856 square miles. The basin includes two main tributaries, the Skykomish and Snoqualmie Rivers (Williams *et al*. 1975). The Snoqualmie and the Skykomish Rivers converge to form the Snohomish River about 20 miles upstream of its Puget Sound delta near Everett (WDF 1975). Washington State classifies all three rivers as Class A water bodies (WAC 1997). Average annual precipitation in the watershed is about 87 inches per year. Based on rainfall records at Snoqualmie Falls, 70% of the precipitation falls sometime between October and March, and 10% falls between June and August (DOE 1995).

Similar to chinook habitat throughout the PS ESU, the Snohomish River basin has been significantly altered by human activities for over a century. The Snohomish River flows through agricultural land for the majority of its length. Large portions of the upper watersheds of the Skykomish and Snoqualmie Rivers deliver altered flow regimes due to historical logging activities, and highway or local road development. As a result of these activities, the Snohomish system typically has higher and more frequent winter and spring flow events than it did historically (Williams *et al.* 1975). Significant portions of the mainstem Snohomish River have been diked and riprap has been placed along its banks. Riparian areas below the town of Snohomish consist of minimal amounts of mature trees and vegetation. Seventy percent of the Snohomish River has no riparian forest greater than or equal to one site-potential tree height (56 meters), (Haas and Collins, 2001). Most of the estuary and floodplain have been altered by the construction of levees, dikes, tide gates and pumphouses to exclude intertidal influence, resulting in the loss of many off-channel habitats. The results of these actions have reduced the carrying capacity of the basin.

The Washington State Department of Ecology (DOE) lists the Snohomish, Skykomish, and Snoqualmie Rivers on the 303(d) list of impaired and threatened water bodies for temperature (DOE 1998). In addition, the Snohomish River is on the DOE's 303 (d) list for copper and mercury. Additional water quality problems in the Snohomish River Basin are associated with polychlorinated bi-phenyls (PCBs), phenols, fecal coliform, and dissolved oxygen levels. Additional water quality problems in the Skykomish and Snoqualmie Rivers are associated with fecal coliform and dissolved oxygen (DOE 1995).

Increased water temperatures in the mainstem affect habitat suitability for spawning, and are typically associated with impaired riparian function (TAG 2002). Increased water temperatures also affect habitat suitability for rearing juveniles and increase habitat suitability for predator species that prey on juvenile salmon (TAG 2002).

Floodplain

The bridge is located at a constriction point where the floodplain is about 1,800 feet wide. Upstream of the bridge, steep slopes confine the floodplain on the left bank, but the floodplain extends broadly across lowland areas on the right bank. Downstream of the bridge, the floodplain extends nearly a half-mile from the left bank, but steep slopes on Bald Hill confine the right bank. During a 100-year flood, the average water depth in the floodplain under the bridge is about 16 feet, based on an average right bank floodplain elevation of plus 28 feet NGVD (WSDOT 2003a).

As a result of past habitat changes, the floodplain and mainstem of the Snohomish are thought to be capable of producing only a fraction of the historical number of juvenile chinook (SBSRTC 1999; Pentec 1999). Specifically, the development of armored banks, dikes and levees, and the elimination of riparian vegetation have resulted in the lack of mainstem and off-channel spawning and rearing habitats. Higher velocity flows, the result of the river's inability to access its floodplain in most flow events, have further reduced floodplain connectivity and functions.

Upland and Riparian Vegetation

The action area is within the Puget Sound Douglas-fir forested zone in Washington State (USGS 1991). Upland forest in the action area is a mixture of trees, including Douglas-fir (*Pseudotsuga menziesii*), western hemlock *(Tsuga heterophylla)* and western red cedar *(Thuja plicata*). Trees such as black cottonwood (*Populus balsamifera*), red alder *(Alnus rubra)*, and big-leaf maple *(Acer macrophyllum)* dominate areas in the 100-year floodplain. Riparian areas also include cascara (*Rhamnus purshiana*) and European ash (*Sorbus aucuparia*). Plants in the riparian understory include red-osier dogwood *(Cornus sericea),* salmonberry (*Rubus spectabilis*), snowberry (*Symphoricarpos albus*), beaked hazelnut (*Corylus cornuta*), ocean spray (*Holodiscus discolor*), Indian plum (*Oemleria cerasiformis*), and inclusions of sword fern (*Polystichum munitum*). Non-native invasive plant species are abundant at the project site and consist of Himalayan blackberry *(Rubus discolor)*, Scot's broom *(Cytisus scoparius)*, and Japanese knotweed *(Polygonum cuspidatum)*. The right bank overflow terrace is dominated by grasses and herbaceous species. Species at this location are reed canary grass *(Phylaris arundinacea*), red fescue *(Festuca rubra),* tall fescue *(Festuca arundinacea),* common plantain *(Plantago major),* and field horsetail *(Equisetum arvense)*.

Substrate and Soils

Soils on the left bank are characteristic of the Alderwood series, comprised of glacial till and alluvial materials interbedded with gravel lenses (USDA 1983). Right bank soils are characteristic of the Puyallup and Sultan soil series and consist of non-cohesive sands and fine sediment. Pilchuck soils dominate the islands in the river channel (USDA 1983). The Snohomish riverbed generally consists of coarse sand intermixed with large cobble (average diameter of 30 cm). The Snohomish River bed upstream of the bridge is coarse sand mixed with large cobble, and is not imbedded. The left bank is made up of glacial deposits interbedded with small gravel lenses and the right bank consists of non-cohesive sands and fine sediments (average diameter of 1.0 mm), (WSDOT 2003a). The substrate is not suitable for spawning on the right and left banks. However, chinook salmon spawning occurs in the Snohomish mainstem on large cobble about 0.25 mile downstream of the bridge (Kraemer, pers. Comm. 2003). The

Skykomish River overflow channel is coarse sand and some scoured layers of gravel characteristic of river wash materials, and is imbedded about 80 to100%.

Wetlands

The WSDOT wetland biologists identified and delineated two significant wetlands (Wetlands A and B) within the 100-year flood zone on the right bank terrace adjacent to the Skykomish River overflow channel and one wetland (Wetland E) outside of the 100-year flood zone on the left bank above the Snohomish River (WSDOT 2003b). The DOE classifies Wetland A as a Category I wetland. This wetland is a 0.245-acre (10,704 square feet) riparian wetland that provides shoreline stabilization, groundwater retention and discharge, and seasonal migration passage for salmonids. During regular flooding seasons, the wetland becomes inundated with water and may provide refuge for juvenile salmonids to escape fast moving floodwaters. Wetland B, also a DOE category I wetland, is a 0.038-acre (1,666 square feet) scrub-shrub and emergent wetland, situated at the northeastern corner of the site. It is characterized as a riverine wetland and provides flood flow alteration, sediment removal, nutrient toxicant removal, erosion control, shoreline stabilization, as well as production of organic matter and export. This wetland supports habitat for invertebrates, amphibians, fish, and native plant species (WSDOT 2003b). Wetland E is a 0.02-acre (860 square feet) DOE category IV emergent wetland situated at the northwest corner of the site, and provides sediment, nutrient and toxicant removal, as well as habitat for aquatic invertebrates and amphibians (WSDOT 2003b).

2.1.3 Status of the Species

Puget Sound chinook salmon were listed as threatened under the ESA on March 24, 1999 (64 FR 14308). The ESU includes all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound. This area also includes the Straits of Juan de Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington State. The species status review identified the high level of hatchery production which masks severe population depression within the ESU, as well as severe degradation of spawning and rearing habitats, and restriction or elimination of migratory access as causes for the range-wide decline in PS chinook salmon stocks (NMFS 1998a; 1998b). Critical habitat is not designated for PS chinook.

Chinook salmon are the largest of the Pacific salmon (Netboy 1958), and exhibit the most diverse and complex life history strategies of all salmonids. Two generalized freshwater life-history types were initially described by Gilbert (1912): “stream type” chinook salmon that reside in freshwater for a year or more following emergence; and “ocean type” chinook salmon that migrate to the ocean within their first year. Healey (1983; 1991) has promoted the use of broader definitions for “ocean-type” and “stream-type” to describe two distinct races of chinook salmon, incorporating life history traits, geographic distribution, and genetic differentiation. The generalized life history of chinook salmon involves incubation, hatching, and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. Some male chinook salmon mature in freshwater, thereby foregoing emigration to the ocean.

The PS ESU consists of 31 historically quasi-independent populations of chinook salmon, of which 22 are believed to be extant (PSTRT 2001 and 2002). The populations that are presumed to be extirpated were mostly of early-returning fish, and most of these were in the mid- to southern parts of Puget Sound, Hood Canal, and the Strait of Juan de Fuca. Despite being in the rainshadow of the Olympic Mountains, the river systems in northern Puget Sound maintain high flow rates due to the melting snowpack in the surrounding mountains. Temperatures tend to be moderated by the marine environment.

Chinook salmon in the PS ESU exhibit an ocean-type life history. Although some spring-run chinook salmon populations in the ESU have a high proportion of yearling smolt emigrants, the proportion varies from year-to-year and appears to be environmentally mediated rather than genetically determined. The PS stocks all tend to mature at ages three and four and exhibit similar, coastally-oriented, ocean migration patterns.

The most recent five-year geometric mean natural spawner numbers in populations of PS chinook ranges from 42 to just over 7,000 fish. Most populations contain natural spawners numbering in the hundreds (median recent natural escapement = 481); and of the six populations with greater than 1,000 natural spawners, only two are thought to have a low fraction of hatchery fish. Estimates of historical equilibrium abundance from predicted pre-European settlement habitat conditions range from 1,700 to 51,000 potential chinook spawners per population. The estimates of historical spawner capacity are several orders of magnitude higher than realized spawner abundances recently observed throughout the ESU.

Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. Long-term trends in abundance and median population growth rates for naturally spawning populations of chinook in Puget Sound both indicate that approximately half of the populations are declining and half are increasing in abundance over the length of available time series. The number of populations with declining abundance over the short term (8 of 22 populations) is similar to long-term trends (12 of 22 populations).

As in the action area, anthropogenic activities have blocked or reduced access to historical spawning grounds and altered downstream flow and thermal conditions throughout the ESU. In general, upper tributaries have been impacted by forest practices while lower tributaries and mainstem rivers have been impacted by agriculture and /or urbanization. Diking for flood control, draining and filing of freshwater and estuarine wetlands, and sedimentation due to forest practices and urban development are cited as problems throughout the geographic range of the ESU (WDF, *et al*. 1993). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in several basins within the ESU. Bishop and Morgan (1996) identified a variety of habitat issues for streams in the range of this ESU including: (1) changes in flow regime (all basins); (2) sedimentation (all basins); (3) high temperatures in some streams; (4) streambed instability; (5)

estuarine loss; (6) loss of LWD in some streams; (7) loss of pool habitat in some streams; (8) blockage or passage problems associated with dams or other structures; and (9) decreased gravel recruitment. These impacts on the spawning and rearing environment may also have had an impact on the expression of many life-history traits and masked or exaggerated the distinctiveness of many stocks.

The artificial propagation of fall-run stocks is widespread throughout this region. Summer/fall chinook salmon transfers between watersheds within and outside the region have been commonplace throughout this century; thus, the purity of naturally spawning stocks varies from river to river. Nearly two billion chinook salmon have been released into Puget Sound tributaries since the 1950s. Returns to hatcheries have accounted for 57% of the total spawning escapement, although the hatchery contribution to spawner escapement is probably much higher than that due to hatchery-derived strays on the spawning grounds. The electrophoretic similarity between Green River fall-run chinook salmon and several other fall-run stocks in Puget Sound (Marshall, *et al.* 1995) suggests that there may have been a significant and a lasting effect from some hatchery transplants. Overall, the pervasive use of Green River stock throughout much of the extensive hatchery network, within the geographic range of this ESU, may reduce the genetic diversity and fitness fo naturally spawning populations.

Harvest impacts on PS chinook salmon populations averaged 75% (median=85%; range 31 to 92%) in the earliest five years of data availability and have dropped to an average of 44% (median=45%; range 26 to 63%) in the most recent five-year period (BRT 2003).

Overall abundance of chinook salmon within this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be relatively high. Both long- and short-term trends in abundance are predominantly downward, and several populations are exhibiting sever short-term declines. Spring-run chinook salmon populations throughout this ESU are all depressed (WDFW 2002).

Other concerns noted by the Biological Review Team (BRT) are the concentration of the majority of natural production in just two basins, high levels of hatchery production in many areas of the ESU, and widespread loss of estuary and lower floodplain habitat diversity and, likely, associated life history types. Populations within the geographic range of the ESU have not experienced the sharp increases in the late 1990's seen in many other ESUs, more populations have increased then decreased since the last BRT assessment. After adjusting for changes in harvest rates, however, trends in productivity are less favorable. Most populations are relatively small, and recent abundance within the ESU is only a small fraction of estimated historic run size.

Through the recovery planning process, NOAA Fisheries will define how many and which naturally spawning populations of chinook salmon are necessary for the recovery of the ESU as a whole (McElhany *et al.* 2000).

2.1.4 Factors Affecting Species Environment Within the Action Area

Habitat conditions in the action area are heavily influenced by the dynamic nature of the Snohomish River near the mouths of the Skykomish and Snoqualmie Rivers. The Skykomish River overflow channel has frequently changed locations where the river merges into the low-gradient Snohomish River (WSDOT 2003a). Before the 1990 flood, the Skykomish River entered the Snohomish River via the right bank overflow channel. Since the 1990 flood, the Skykomish River has migrated to its current position about 4,000 feet upstream of the bridge, leaving the overflow channel behind.

A scour pool along the left bank of the Snohomish River in the vicinity of the bridge provides in-channel habitat, where depths in excess of 4 feet and high water velocities provide primarily resting habitat for migrating adult chinook. Chinook salmon, primarily juveniles, use portions of the right bank Skykomish River overflow channel as off-channel habitat during medium to high flows. Aerial photos and field visits on November 15, 2002 and May 8, 2003 documented that the overflow channel was mostly dry, consisting of only a backwater channel near the bridge.

Along the right bank, riparian vegetation, LWD and undercut banks are present and contribute to habitat complexity. Riparian vegetation shades and helps to cool the water (Knighton and Nanson 1993) It also provides riparian functions such as evapotranspiration, a supply of LWD, and streambank stabilization. The right bank floodplain terrace may provide some fish refuge in the existing preferential flow pathway and scoured areas during flood events, or during a channel change of the Skykomish River. The floodplain remains connected to the river about 0.5 mile downstream of the bridge on the right bank, but flow is constricted by an existing rock wall. Preferential flow pathways are evident in remnant channels and trails. Flow velocities during a 1- to 2-year event appear to be swift enough to begin channel formation in the preferential flow pathways (WSDOT 2003a).

2.1.5 Status of the Species Within the Action Area

The Snohomish River in the vicinity of the project site provides feeding and rearing habitat for juvenile salmon and is a migration corridor for adult salmon. Runs of PS chinook, coho, PS pink, and other salmon and non-salmon species can be found at varying times of the year.

The Snohomish River system has a combined natural chinook escapement goal of 5,250. The average over the last five years is 4,450 (range 3,176 to 6,300). The escapement of 6,300 in 1998 is the first time the identified escapement goal has been met since 1980. Although shown to have a negative trend (ranging from -0.7% for natural-origin fall chinook to -11.3% for mixed hatchery and natural-origin fall chinook), adult returns to the river have been relatively stable, falling below 3,000 only twice since 1968. Snoqualmie River escapement levels averaged 1,287 fish/year from 1986 to 2001. The age composition of returning Snoqualmie River fall chinook showed a relatively strong age five component (28%), relative to other PS fall stocks. Age three and four fish comprised 20% and 46%, respectively, of returns in 1993 and 1994 (Meyers *et al.* 1998).

Juvenile chinook in the Snohomish River system typically display two dominant life history strategies (SBSRTC 1999; Pentec 1999). After emergence from redds, "ocean type" chinook typically spend from one to three weeks in freshwater habitats before moving to the estuary. After one to six months in the estuary, ocean type chinook then move to nearshore areas of Puget Sound and the Pacific Ocean.

In contrast, "stream type" chinook typically remain in freshwater environments for up to a year or more before entering the saltwater environment. Accordingly, freshwater rearing habitat is particularly important for stream type fish. Snohomish Basin chinook are either summer or fall stocks. Most Snohomish summer/fall chinook smolts emigrate as sub-yearlings ocean-type, but a relatively large proportion of smolts (33% in 1993 and 1994 samples) are stream-type (Meyers *et al.* 1998). Of returning fall chinook, 25% to 30% showed a stream-type life history (Snohomish Basin Salmonid Recovery Technical Committee 1999 *in* NMFS 2001). No other summer or fall chinook stocks in Puget Sound produces this high a proportion of yearling smolts (Puget Sound chinook Harvest Management Plan). Little is known about the life history pattern of stream-type chinook, which rear in fresh water up to 18 months an comprise roughly one-quarter of the population (Haas and Collins 2001). In general, juvenile chinook utilize the edge habitat of the mainstem and sloughs, avoiding higher velocity flows near the center of the channel (Lister and Genoe 1970, Bjornn and Reiser 1991). Healey (1982) describes the use of the shoreline by young chinook as one of extreme dependence for feeding, rearing and refuge. During the juvenile out-migration, smolts migrate downstream sometime between April 15 and July 15 (WDF 1975).

Summer chinook enter freshwater from May through July and into August, spawning primarily in September. Fall chinook spawn from late September through October. However, fall chinook spawning in the Snoqualmie River continues through November (WDF *et al*. 1993). Snohomish chinook stocks include two genetically distinct stocks including the Skykomish River and Snoqualmie River stocks (PSTRT 2001). Both stocks are managed as a single unit, and are rated as depressed in the WDFW 2002 Draft Salmonid Stock Inventory (SaSI) report based primarily on low stock productivity (WDFW 2002). Snohomish Basin chinook are known to spawn throughout the mainstem of the river from above the town of Snohomish (RM 13) to the confluence of the Skykomish and Snoqualmie Rivers (RM 21); in the mainstem of the Skykomish and Snoqualmie Rivers, as well as the North and South Forks of the Skykomish River; and tributaries including the Pilchuck, Woods, Wallace, Raging and Sultan Rivers, as well as Bridal Veil, Elwell, and Tokul Creeks (WDFW 2002). The WDFW has documented a chinook redd (Skykomish stock) near the Snohomish River right bank about 0.25 mile downstream of Bridge #522/138. Gravel substrate suitable for spawning is located on the right bank about 200 feet downstream of the bridge; however, the WDFW has not documented any species spawning at this location (Kraemer pers. comm. 2003).

As a result of past habitat elimination and degradation, the floodplain and mainstem of the Snohomish are thought to be capable of producing a fraction of the historical number of juvenile chinook (SBSRTC 1999; Pentec 1999). Haas (2001) estimated that the mainstem rearing capacity has been reduced up to 76% relative to the historical habitat, while the floodplain presmolt rearing capacity for juvenile chinook has been estimated to have been reduced by 96% (1.2 million to 36,000). This has been attributed to the estimated 95% loss of PS chinook rearing capacity in the floodplain (Haas and Collins, 2001). The lack of off-channel rearing habitat and higher velocity flows is a result of the river's inability to access its floodplain in most flow events. This likely results in the premature introduction of juvenile PS chinook into the salt and estuary environments. This dynamic is a major limiting factor for chinook populations in the Snohomish, as the juveniles are subjected to environments to which they are not physiologically prepared, likely resulting in decreased growth and survival (NMFS 2001).

2.1.6 Relevance of the Environmental Baseline to the Species' Current Status

Presently, because of degraded conditions described in the preceding section, the environmental baseline does not meet all of the biological requirements of PS chinook. The status of PS chinook as a threatened species is in part a function of declining conditions in the species' environment. As described above, various anthropogenic features, such as modified floodplain, hardened banks and levees, disruption of hydrological processes, and decreased access to rearing areas have negatively influenced the biotic features necessary to support healthy populations of chinook. While other factors, such as ocean conditions, harvest levels, and natural mortality from predation and disease, influence the current status of this ESU, the baseline conditions contribute to the net effect of depressing the populations' viability.

2.2 Analysis of Effects

NOAA Fisheries evaluates the changes to chinook habitat caused by the proposed action per the Habitat Approach (NMFS 1999). Changes resulting from the proposed action are expressed in terms of whether they are likely to *restore*, *maintain*, or *degrade* an indicator of functional chinook salmon habitat. By examining the effects of the proposed action on the habitat components of a species' biological requirements, NOAA Fisheries can gauge how the action will affect the population variables that constitute the rest of a species' biological requirements and, finally the effect of the action on the species (NMFS 1999).

This effects analysis includes the probable direct and indirect effects of the action on PS chinook salmon "together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02.). Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated actions and interdependent actions. Excluded are any future Federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) (50 CFR 402.02). Indirect effects are defined in 50 CFR 402.02 as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." They include the effects on listed species of future activities that are induced by the proposed action and that occur after the action is completed. "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification" (50 CFR 403.02). "Interdependent actions are those that have no independent utility apart from the action under consideration"

(50 CFR 402.02).

2.2.1 Effects of the Proposed Action

The proposed Snohomish River Bridge (No. 522/138) Scour Repair project will have direct effects on the physical aspects of PS chinook habitat in the Snohomish River and the Skykomish River overflow channel. In addition, the PS chinook will experience direct effects from the proposed project as they have the probability to be present in the action area during project construction. Characteristics of their life history for the Snohomish River indicate that up to one-third of juvenile chinook stay in the Snohomish River system for one year before migrating to the ocean (Meyers *et al.* 1998).

Direct, temporary effects include the following: decrease in water quality (temperature, sediment/turbidity, and chemical contamination), removal of riparian vegetation, filling of wetlands, and disturbance of instream substrate. These effects are the result of the nature, extent, and duration of the construction activities in the water and whether the fish are migrating or rearing during the time of the activity.

Indirect, long-term effects include the following: disturbance of instream substrate, LWD removal and placement, changes to streambank conditions, reduction or enhancement of pool frequency and quality, and changes to channel conditions and dynamics such as floodplain connectivity.

Water Quality

Water temperatures within the off-channel habitat of the Skykomish River overflow channel will temporarily increase and then decrease as a result of construction activities. The permanent removal of 0.02 acre of streambank vegetation for the construction of the streambank barb keyways has the potential to increase water temperatures. The existing overhanging willows and alder trees provide shade to ensure cooler water temperatures for adults and juvenile salmonids. The replacement of this existing vegetation with riprap for the keyways as well as the placement of riprap both above and below the OHWM for the barbs has the potential to elevate water temperature in this habitat. Riprap may function as a conductive heat source. The nature of the substrate may affect heat transfer, and bedrock transfers heat more efficiently than gravels (Spence *et al*. 1996). Therefore, the greater the mass available to receive solar radiation the greater the heating potential. Heat collected by the rock during the day elevates night-time temperatures thereby dampening diel temperature fluctuations and elevating the daily maxima. However, scour-induced pool formation on the upstream side and at the waterward ends of barbs will provide deeper pockets of water with cooler water temperatures during low to moderate flows. Conservation measures such as the installation of LWD and re-vegetation of riparian areas will provide shade and cooler water temperatures for rearing juveniles. While there is some potential for short-term negative effects to water temperature, NOAA Fisheries expects that with the above conservation measures, the project will lead to cooler water temperatures within the action area.

The construction of the barbs will temporarily increase turbidity and sedimentation in the action area. The installation of riprap below the OHWM and streambank excavation for barb keyways will likely cause the disturbance of localized sediments into the water column creating turbidity likely to be detectable when compared to background levels. Sediment can also enter the water from upland construction activities such as temporary road construction and removal, riparian vegetation removal, and equipment use, if erosion control measures fail. Sediment control measures have a variable failure rate dependant largely on individual contractor. Such sedimentation may temporarily displace existing benthic fauna, including invertebrates and aquatic insects. Suspended sediment may impact adult and juvenile fish in the action area near the bridge through clogged gills. Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore *et al.*1980; Birtwell *et al.* 1984). Scientists have observed fish moving laterally and downstream to avoid turbid plumes (McLeay *et al.* 1984, 1987). It should be noted that some reported positive effects from increased sedimentation include providing refuge and cover from predation (Gregory and Levings 1988).

Salmonids have evolved in systems with periodic short-term pulses (days to weeks) of high-suspended sediment loads, often associated with flood events, and areas adapted to such high pulse exposures (Bjorn and Reiser 1991). The duration of turbidity exposure is the critical determinant of the occurrence and magnitude of physical and behavioral effects (Newcombe and MacDonald 1991). In general, chronic exposure to increased turbidity levels has been found to cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al*. 1987; Lloyd 1987; Servizi and Martens 1991).

NOAA Fisheries expects the temporary effects of construction-related sedimentation and turbidity to be minimized through conservation measures such as timing in-water work when juvenile and adult abundance can be expected to be low, when river discharge is low, and when weather is generally favorable for construction. Additional conservation measures to minimize sedimentation and turbidity include strict adherence to the TESC plan, as well as installation and maintenance of silt fencing around all access road footprints according to design specifications standards. In addition, WSDOT will obtain a water quality 401 certification from the DOE, and will monitor water quality during construction. This permit designates a mixing zone for inwater work during construction in bodies of water the size of the Snohomish River that will extend 100 feet upstream and 300 feet downstream of the proposed inwater construction (WAC 173-201A-120A).

The use of naturally occurring materials for the project (*e.g.* riprap, LWD, and live stake fascines), will not add any new chemical contaminants into the system. However, as with all construction-related activities, accidental releases of fuels, lubricants, and other construction related chemicals could injure or kill PS chinook and other aquatic organisms. The use of vegetable-based hydraulic fluids for all construction vehicles as well as implementation of WSDOT's SPCC conservation measure will minimize this effect.

Riparian Vegetation

The direct effects of riparian vegetation removal will be minimized by WSDOT confining disturbance solely to areas of project construction, such as access roads, around the rock wall, and the immediate vicinity of the new barb keyways. Clearing for access roads adjacent to the overflow channel will impact native shrubs and Himalayan blackberry but will avoid impacts to existing wetlands and trees in the floodplain. A maximum of 25 cottonwood trees, 8 to 29 inches dbh, that are rooted in the spaces of the rock wall may fall down during removal of the rock wall. WSDOT will leave small sections of the rock wall in place to minimize this impact.

The temporary removal of riparian vegetation directly effects PS chinook by reducing evapotranspiration and streambank stability leading to erosion and sedimentation, increasing water temperatures, reducing leaf litter and organic input for invertebrate/aquatic insect production, and reducing LWD recruitment. Loss of invertebrate production reduces the prey base of PS chinook. Invertebrate/aquatic insect production associated with riparian vegetation removal is seldom affected in the long-term, however. Consequently, only minimal and short-term impacts to insect production are expected to occur (Spence *et al*. 1996).

The WSDOT will minimize direct effects to riparian vegetation through the following project actions and conservation measures:

- Vegetation will be cleared and not grubbed. The existing roots will continue to stabilize the banks and uplands until re-vegetation is successful.
- Geo-textile fabrics or geo-grid mats will be used to separate native soils from the access road materials and wood chips will be used in the construction of the access roads, allowing oxygen to flow to the existing vegetation and roots below.
- Any cut or fallen trees will be left in the floodplain to maintain a source of LWD and roughness features in the project area.
- Following access road removal, WSDOT will re-vegetate the access roads with native vegetation.
- WSDOT will monitor all plantings for a minimum of three years, to ensure that riparian functions are maintained over the long term.

NOAA Fisheries expects WSDOT's actions to minimize short-term effects to riparian vegetation and maintain the long-term riparian vegetation environmental baseline in the action area.

Wetlands

Vegetation clearing for the left bank access road will result in temporary impacts to 0.02 acre of Wetland E affecting sediment, nutrient and toxicant removal, and habitat for aquatic invertebrates and amphibians. As this wetland does not provide habitat for PS chinook, no direct effects to PS chinook are anticipated by NOAA Fisheries. WSDOT will temporarily disturb the buffer of Wetland A to remove the rock wall and build access roads for the installation of the riprap barbs on the right bank. WSDOT considers these effects to be temporary. They will ensure that the removal of fill will be minimized and a re-vegetation plan will be implemented to provide a level of hydrologic connection between the river and the riparian wetlands. However, as Wetland A provides refuge habitat for PS chinook juveniles during flood events, existing conditions could be degraded in the short-term during ensuing high flow events.

Substrate

The placement of riprap above and below the OHWM within the Snohomish River and the Skykomish River overflow channel will permanently degrade the streambed substrate in the project area. Placement of riprap on top of the streambed may injure or kill PS chinook juveniles that hide in interstitial spaces rather than avoid the area of disturbance. Timing inwater work during low juvenile and adult abundance will minimize this effect. The WSDOT designed the barb on the left bank to influence the near bank velocity and sediment transport systems. Installation of the barb will permanently displace 0.07 acre (2,870 square feet) of in-channel PS chinook habitat comprised of coarse sand mixed with large cobble. Keying this barb into the existing riprap bank protection will minimize the permanent effects by reducing the barb footprint and the amount of fill below the OHWM. Reduced velocities near the bank will deposit sand and gravel upstream and downstream of the barb in a zone about 100 to 200 feet long. This will temporarily degrade existing conditions resulting in a temporary loss of resting habitat for migrating adult chinook along the left bank, but may increase the suitability of the habitat for juvenile chinook feeding and rearing in this area.

The barbs on the right bank are designed to redirect momentum of the river away from the eroding bank Installation of the three barbs on the right bank will displace 0.17 acre (7,761 square feet) of off-channel habitat comprised of coarse sand and some scoured layers of gravel, which are 80 to 100% embedded. Since the 1990 flood, the existing Skykomish overflow channel has provided off-channel habitat for PS chinook. Lower velocities in the overflow channel during normal flows recruit finer substrates and organic material resulting in increased invertebrate/aquatic insect production, thereby providing excellent off-channel habitat for juvenile PS chinook feeding and rearing habitat. Shifting of the overflow channel away from the right bank may also shift the location of the sediment delta that forms where the overflow channel empties into the Snohomish River. This delta will move upstream by no more than the distance of channel deflection (about 50 feet). However, once the channel has adjusted to the new flow field, there should be no net change in the volume or rate of sediment delivery into the Snohomish River (WSDOT 2003a). Should the mouth of the Skykomish River shift downstream toward the bridge, the barbs will protect the streambank against erosion. They will also slow velocities along the banks, creating zones of sand deposition upstream and downstream of the structures. These depositional zones typically extend 100 to 200 feet upstream and downstream of the barb, or roughly four times the length of the furthest downstream structure (WSDOT 2003a). Conservation measures will help to minimize the impacts to the substrate on the right bank by incorporating LWD to create roughness, reduce flow velocities, and provide habitat complexity near the hardened substrate. However, as diking, draining, and filling have removed highly productive historic off-channel habitats and altered channel processes that form off-channel habitat in the Snohomish Basin, the permanent loss of this habitat within the footprint of the barbs will degrade the substrate environmental baseline within the action area.

Large Woody Debris

The WSDOT will install LWD into the three barbs on the right bank within the Skykomish River overflow channel to provide shade and cover, as well as to contribute to habitat complexity. Incorporating LWD into the barbs will not interfere with existing LWD in the channel. Any future LWD build-up against the right bank barbs will not be removed unless it directly threatens the bridge piers. However, if a 100-year flood event occurs, it is likely that WSDOT will need to repair or replace the barbs. The WSDOT will address barb repair or replacement as a part of a separate action in the event or structural damage to the barbs. Further, WSDOT will monitor the effectiveness of the LWD and include contingencies to remediate poor LWD functionality or identify alternative locations within the river reach for LWD placement. Any cut or fallen trees resulting from the construction of access roads or breach and removal of the rock wall will be left in the floodplain to maintain a source of LWD. LWD is central to determining channel morphology and biological condition in many Pacific Northwest streams (Spence *et al.* 1996). Pool formation, gravel and organic material retention, velocity disruption, and cover for fish from predators are all strongly reliant on LWD. Other than natural mortality, sources of large wood recruitment to streams include bank erosion, snow avalanche, mass wasting events, blow down, and transport from upstream (Gurnell *et al.* 1995).

The project also includes replanting native vegetation to provide a future source of LWD recruitment. NOAA Fisheries expects that the above project actions and conservation measures will improve the environmental baseline for LWD within the action area and the watershed.

Streambank Condition

The project is designed to stabilize the existing streambanks to protect the 522/138 bridge. To minimize impacts to the streambank, the left bank barb will be keyed into the existing riprap. However, the majority of the left bank within the bridge right-of-way is armored downstream of Pier 2. The project will further degrade existing streambank condition on the right bank by removing vegetation and keying new riprap into the naturally-eroding banks. In addition, the use of heavy equipment in the riparian area and along the streambank may cause compaction of soils which could reduce infiltration and natural recruitment of riparian vegetation. This could lead to increased deposition of fine sediments into the thalweg which, in turn would reduce available spawning habitat (WSDOT 2003a).

Bank hardening techniques in a dynamic river environment reduce the potential for channel complexity by limiting channel migration and the recruitment of LWD and gravel. Rivers continuously transport eroded material downstream from areas of erosion to areas of deposition. Transport varies with discharge and is therefore episodic (Kondolf 1994). Armoring streambanks limits lateral channel changes and gravel recruitment (Schmetterling *et al*. 2001).

Bank hardening may also sequester on-site gravel sources from capture by the active river system and cause downcutting due to increased flow velocities. Downcutting may extend well upstream or downstream, and result in the perching of historic depositional gravel layers above the OHWM, thereby reducing gravel capture rates within the system. A net loss of gravel recruitment to the system may ultimately result in the loss of sufficient gravels to support successful salmon spawning. The cumulative effect of gravel isolation may lead to the loss of enough sources that the waterway becomes gravel-limited. Overall, streambank stabilization will reduce the potential for side channel formation and lateral channel migration in the floodplain, which are natural processes contributing to habitat complexity. These processes contribute to undercut banks and overhead cover which help provide important summer habitat for salmonids (Brusven *et al*. 1986; Beamer and Henderson 1998).

To help minimize the effects of bank hardening, WSDOT will plant native vegetation and place live fascines on the right bank to create channel roughness and help reduce flow velocities. This will help develop a riparian zone along this portion of the stabilized bank and will increase shade, lower water temperatures, and increase the recruitment of LWD, leaf litter and organic debris for invertebrate/aquatic insect production. These conservation measures will have the net result of maintaining the streambank condition environmental baseline within the action area.

Pool Frequency and Quality

Installation of the barbs will fill existing scour holes along both banks, thereby resulting in the loss of resting and rearing habitat for PS chinook migrating adults and juveniles. The barbs will also have long-term effects on river channel dynamics and processes that will indirectly effect PS chinook. The barbs will discourage scour and pool formation close to the inwater bridge piers by funneling the thalweg down the center of the Snohomish River channel immediately beneath the bridge.

On the left bank, the channel capacity will be reduced by the barb until the first high water event, when the barb will begin to reshape the channel near the bank. Increased velocities along the tip will form a scour hole and attendant pool habitat that will increase channel capacity beneath the bridge. This scour hole will overlap the existing scour pool between Piers 2 and 3. Scour hole formation and the higher velocities at the barb tip will compensate for the sediment deposition near the bank, resulting in no net change in channel conveyance. The thalweg will return to the left bank about 125 to 150 feet downstream of the barb (WSDOT 2003a). As the barb deflects flow into the river channel, energy will dissipate on the channel bottom, creating scour. Flow velocities are likely to decrease significantly before they return to the bank. Therefore, additional bank stabilization will not be necessary (WSDOT 2003a).

On the right bank, the long-term effects of installation of the three barbs will be localized within the Skykomish River overflow channel. The WSDOT has designed the barbs to deflect the thalweg of the channel away from the right bank. The net effect after the first flood will be to build-up the right bank and shift the channel towards the gravel bar, eventually creating new scour pools and attendant pool habitat at the tips of each barb (WSDOT 2003a).

The placement of LWD into the barbs will help dissipate water velocities which will aide in the formation of pool habitat. The LWD will also increase the complexity of the channel and will help recruit organic material and provide cover from predatory fish for juvenile PS chinook.

Finally, WSDOT will monitor the effectiveness of the barbs to ensure they function properly. WSDOT will take remedial steps to restore proper functionality if necessary. NOAA Fisheries expects these actions and conservation measure will maintain existing conditions for pool frequency and quality within the action area.

Floodplain Connectivity

The WSDOT designed the three right bank barbs within the Skykomish overflow channel to overtop during the one- to two-year flood event in order to maintain overbank flows. However, bank stabilization in this area will hinder bank erosion, which contributes to the formation of side channels, undercut banks, and habitat complexity in the floodplain. The project will place 0.016 acre of rock tetrapods in the preferential flow pathways in the floodplain to help spread flows out across the floodplain terrace. This action, in conjunction with breaching and removing the 0.05 acre rock wall, will foster the connection of 33.02 acres of downstream floodplain areas and will improve refuge habitat for juvenile PS chinook during high flow events. In addition, WSDOT will plant cottonwood trees in the footprint and downstream of the rock wall to help restore riparian function within the floodplain. NOAA Fisheries anticipates that these actions will improve floodplain connectivity in the action area.

2.3 Cumulative Effects

Cumulative effects are defined as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they might require separate consultation pursuant to section 7 of the ESA.

Improvements to the transportation network in the action area have the potential to increase residential, commercial, and industrial development. Expected effects on listed PS chinook from future development include potential degradation of water quality and hydrology from the increased sedimentation during construction, increase of impervious surface, loss of functional riparian habitat, and the loss of productive stream channel by adding new stream crossings.

Impervious surfaces can degrade water quality through non-point source (NPS) pollution, and adversely affect the local hydrology of surface waters through reduced infiltration and increased surface and stormwater conveyance. Research in the PS ESU has shown that most physical, chemical and biological characteristics of stream quality were found to degrade with increasing impervious surfaces (May *et al*.1996).

Increasing the number of stream crossings could increase the amount of bank hardening, turbidity, and sedimentation in local streams and reduce overall channel complexity. Finally, associated impacts from transportation and development could pose threats to riparian areas and wetlands as these areas are cleared and filled.

There is the potential for positive, cumulative effects of this project. Proposed restoration projects downstream of the action area would benefit from restored floodplain connectivity as a result of this project. Snohomish County has planned restoration activities up to 2,000 feet downstream of the bridge in Lords Hill Park. Projects include restoring a relic side channel located about 600 feet downstream of the bridge, removing bank armor, and re-foresting the floodplain. Snohomish County is investigating two dike removal options downstream of the bridge at Bob Herman Wildlife Park and Crab Bend (Haas Pers. comm. 2003).

2.4 Conclusion

NOAA Fisheries has determined that the effects of the proposed action would not likely jeopardize the continued existence of PS chinook salmon. NOAA Fisheries used best available scientific and commercial data in this analysis. The determination of no jeopardy was based on the following:

- There will be short-term direct effects on water quality (temperature, sediment and turbidity, and potentially chemical contamination) from project construction. However, elements of the proposed action, BMPs, and conservation measures will minimize these effects and maintain water quality in the action area.

- There will be permanent direct effects to riparian vegetation and streambank condition from the removal of riparian vegetation and construction of the barb keyways. In addition, there will be temporary direct effects to riparian vegetation and streambank stability through the removal of riparian vegetation for construction of access roads and the removal of the existing wall. These direct effects will be minimized through access road design and construction elements, re-vegetation conservation measures, and a monitoring plan. The minimization actions will help maintain the riparian vegetation and streambank condition in the action area.

- There will be long-term direct and indirect effects to substrate from the placement of riprap fill along the left bank of the Snohomish River and along the right bank in the Skykomish River overflow channel. Conservation measures such as the incorporation of LWD into the fill on the right bank, coupled with the monitoring plan, will help minimize the effects to important juvenile PS chinook rearing and feeding habitat. The long-term effects will be minimized through natural hydrologic channel processes that will redistribute finer-grain bed materials in response to hydraulic influences. However, the substrate and associated habitat within the Skykomish River overflow channel portion of the action area will be permanently degraded in the areas of barb placement.

- Installation of LWD into the riprap barbs along the right bank overflow channel and replanting riparian vegetation along the streambank as a future source of LWD, in conjunction with the associated monitoring plans, will improve LWD in the action area and within the watershed.

- There will be temporary, direct effects and long-term indirect effects to pool frequency and quality from placement of riprap fill. Conservation measures such as the incorporation of LWD into the fill on the right bank and the monitoring plan will help minimize the effects to important adult migratory PS chinook resting habitat and juvenile PS chinook rearing and feeding habitat. The long-term effects will be minimized through natural hydrologic channel processes that produce scour and pool habitat associated with the barbs. These conservation measures and physical processes will maintain the existing pool frequency and quality in the action area.

- The configuration of the barbs, as well as project elements and conservation measures within the floodplain, (*e.g.* breaching/removal of the rock wall, placement of tetrapods, and re-vegetation) will improve floodplain connectivity in the action area.

2.5 Reinitiation of Consultation

This concludes formal consultation on the Snohomish River Bridge (No. 522/138) Scour Repair project. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action had been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

2.6 Incidental Take Statement

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct" [16 USC 1532(19)]. Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including: breeding, spawning, rearing, migrating, feeding or sheltering" [50 CFR 222.102]. Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering" [50 CFR 17.3]. Incidental take is defined as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant" [50 CFR 402.02]. The ESA as section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

An incidental take statement specifies any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures (RPMs) that are necessary to minimize take and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

2.6.1 Amount or Extent of Take Anticipated

Various life stages of PS chinook are likely to encounter project construction activities because they use the action area for foraging, rearing, and migration during all or part of the year. Project effects include changes in water quality and modifications to instream and riparian habitats to an extent that causes harm. Therefore, the proposed action is reasonably certain to result in incidental take of PS chinook salmon.

For habitat-affecting activities, NOAA Fisheries cannot estimate a specific amount of incidental take of individual PS chinook, despite the use of the best available scientific and commercial data. In cases where the number of individual fish cannot be anticipated, NOAA Fisheries characterizes the amount of take as "unquantifiable." NOAA Fisheries uses a surrogate for the extent of take based on the extent of habitat affected. Therefore, the estimated extent of habitat affected by construction activities represents the extent of take exempted in this incidental take statement.

The incidental take exempted in this incidental take statement is that which would occur from the construction of the Snohomish River Bridge (No. 522/138) Scour Repair. The extent is limited to the downstream extent of harm from temporary habitat degradation caused by turbidity up to 300 feet from the point of compliance per the August 4, 1998 DOE and WSDOT Implementing Agreement regarding compliance with the state of Washington Surface Water Quality Standards (WAC 173-201A). Incidental take is exempted for clearing up to 0.55 acre of riparian vegetation and filling up to 0.03 acre of Wetland E for the construction of temporary access roads and permanent barb keyway locations. In addition, incidental take of habitat, resulting from the footprint of the barbs, shall not exceed 0.26 acre below OHWM and 0.048 acre above OHWM for the footprint of the barbs and tetrapods.

2.6.2 Reasonable and Prudent Measures

Reasonable and Prudent Measures (RPMs) are non-discretionary measures to minimize take, that may or may not already be part of the description of the proposed action. They must be implemented as binding conditions for the exemption in section 7(o)(2) to apply. The FHWA has the continuing duty to regulate the activities covered in this incidental take statement. If the FHWA fails to require the applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(0)(2) may lapse. NOAA Fisheries believes that activities carried out in a manner consistent with these RPMs, except those otherwise identified, will not necessitate further sit-specific consultation.

Activities which do not comply with all relevant RPMs will require further consultation. NOAA Fisheries believes that the following RPMs are necessary and appropriate to minimize take of listed fish resulting from implementation of the action.

1. The FHWA shall ensure minimization of incidental take from construction activities.

2. The FHWA shall ensure minimization of incidental take from effects on riparian and instream habitat.

3. The FHWA shall ensure take is minimized by implementing the monitoring and contingency plans for the effects of instream features.

2.6.3 Terms and Conditions

To comply with ESA section 7 and be exempt from the take prohibitions as outlined in section 9 of the ESA, the FHWA must comply with the terms and conditions that implement the RPMs. The conservation measures, BMPs, and monitoring/contingency plans, as summarized in this Opinion are incorporated here by reference as terms and conditions of this Incidental Take Statement. The following terms and conditions are non-discretionary:

1. To implement RPM No. 1 (construction activities), the FHWA shall ensure that:

    a. Staging areas shall be established (used for construction equipment storage, vehicle storage, fueling, servicing, etc) beyond the 100-year flood prone area in a location and manner that shall preclude erosion into or contamination of the stream or floodplain.

    b. Sediment barriers shall be placed around disturbed sites to prevent erosion and sedimentation associated with equipment and material storage sites, fueling operations, and staging areas from entering the stream directly, through natural drainage or road side ditches.

    c. All equipment shall be cleaned, leaks repaired, and external oil, grease, dirt and mud shall be removed before arriving at the project site. All equipment shall be inspected before unloading at the site. Thereafter, all equipment shall be inspected daily for leaks or accumulations of grease, and any identified problems shall be fixed before entering streams or areas that drain directly to streams or wetlands.

d. Equipment shall be fueled and serviced in an established staging area. When not in use, vehicles shall be stored in the staging area.

e. All stationary power equipment (*e.g.*, generators, cranes, stationary drilling equipment) operated within 150 feet of any stream, water body or wetland shall be diapered to prevent leaks, unless suitable containment is provided to prevent potential spills from entering any stream or water body.

f. All project operations shall cease, except efforts to minimize storm or high flow erosion, under high flow conditions that result in inundation of the project area.

g. Inwater work shall be conducted when the least amount of water is present in the Skykomish River overflow channel during the approved work window of 1 July to 1 September.

h. All exposed soils shall be covered at the end of each day.

2. To implement RPM No. 2 (riparian and instream habitats), the FHWA shall ensure that:

a. Coniferous tree species shall be used for LWD.

b. Rehabilitation of all disturbed areas shall be initiated in a manner that results in similar or better than pre-work conditions through spreading of stockpiled materials, seeding, and/or planting with native seed mixes or plants. If native stock is not available, soil-stabilizing vegetation (seed or plants) that does not lead to propagation of exotic species shall be used.

c. Necessary site restoration activities shall be completed within five days of the last construction phase. Each area requiring vegetation shall be planted before the first April 15th following construction.

d. No herbicide application shall occur as part of the permitted action. Mechanical removal of undesired vegetation and root nodes is permitted.

e. No surface application of fertilizer shall be used within 50 feet of any stream channel as part of this permitted action.

f. Plantings shall achieve an 80% target survival success after three years.
   i. If success standard has not been achieved after three years, the FHWA shall propose an alternative plan that addresses temporary loss of function.
   ii. Plant establishment monitoring shall continue until site restoration success has been achieved.

3. To implement RPM No. 3 (monitoring plan and contingencies), the FHWA shall ensure that annual reports for the scour pool, LWD, and re-vegetation qualitative and quantitative monitoring programs shall be provided to NOAA Fisheries by December 31 of each year.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2));

- NOAA Fisheries must provide conservation recommendations for any Federal or state activity that may adversely affect EFH (section 305(b)(4)(A));

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the effect of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency must explain its reasons for not following the recommendations (section 305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA section 3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

3.2 Identification of Essential Fish Habitat

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC 1999) has designated EFH for three species of Federally-managed Pacific salmon: chinook, coho, and PS pink salmon (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the impacts to these species' EFH from the proposed action is based on these descriptions and information provided by the FHWA.

3.3 Proposed Action

The proposed action and action area are detailed in sections 1.2 and 1.3 of this document. The action area includes habitats that have been designated as EFH for various life-history stages of chinook, coho, and PS pink salmon.

3.4 Effects of the Proposed Action

As described in sections 2.2, 2.3 and 2.4 of this document and in the BA provided by WSDOT, the proposed action may result in detrimental short- and long-term impacts to a variety of habitat parameters. These adverse effects are:

1. Short-term degradation of water quality due to sediment plumes/pulses during proposed construction activities.

2. Long-term loss of channel forming processes in the Skykomish River overflow channel floodplain.

3. Short-term degradation of habitat due to removal of riparian trees and vegetation, and temporary fill within wetlands.

4. Long-term loss of stream channel habitat due to the installation of proposed barbs below OHWM. The right bank barbs will permanently displace undercut banks, river substrate and streambank vegetation.

3.5 Conclusion

NOAA Fisheries believes that the proposed action would adversely affect designated EFH for chinook, coho, and PS pink salmon.

3.6 Essential Fish Habitat Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. While NOAA Fisheries acknowledges that the conservation measures, BMPs, and monitoring/contingency plans described in the biological opinion will be implemented by WSDOT, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. The adverse effects to water quality (adverse EFH effect No. 1) and channel forming processes in the Skykomish River overflow channel floodplain (adverse EFH effect No. 2) cannot be further minimized, and no conservation recommendations are applicable. Consequently, NOAA Fisheries has the following EFH conservation recommendations that, if implemented, will minimize the potential adverse impacts of the proposed project and conserve EFH:

1. To minimize the adverse effects to riparian vegetation and wetlands (adverse EFH effect No. 3), the FHWA should:
2.
    a. Use coniferous tree species for LWD.

    b. Initiate rehabilitation of all disturbed areas in a manner that results in similar or better than pre-work conditions by spreading stockpiled materials, seeding, and/or planting with native seed mixes or plants. If native stock is not available, use soil-stabilizing vegetation (seed or plants) that does not lead to propagation of exotic species.

    c. Complete necessary site restoration activities within five days of the last construction phase. Replant each area requiring vegetation before the first April 15th following construction.

    d. Prohibit the use of herbicides. Mechanical removal of undesired vegetation and root nodes should be implemented.

    e. Prohibit the application of fertilizer to surfaces within 50 feet of any stream channel.

    f. Achieve an 80% target survival success after three years for plantings.
        i. If success standard has not been achieved after three years, the FHWA should propose an alternative plan that addresses temporary loss of function.
        ii. Plant establishment monitoring should continue until site restoration success has been achieved.

2. To track the adverse effects to stream channel habitat (adverse EFH effect No. 4), the FHWA should provide annual reports for the scour pool, LWD, and re-vegetation.

3. To track the adverse effects to stream channel habitat (adverse EFH effect No. 4), the FHWA should provide annual reports for the scour pool, LWD, and re-vegetation qualitative and quantitative monitoring program to NOAA Fisheries by December 31 of each year.

3.7 Statutory Response Requirement

Pursuant to the MSA (section 305(b)(4)(B)) and 50 CFR 600.920(k), Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The FHWA must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(l)).

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